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**FEDERAL - STATE - PRIVATE  
COOPERATIVE SNOW SURVEYS**



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PROCUREMENT SECTION  
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# ***WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES***

**Including Columbia River Drainage in Canada**

Prepared by

**U. S. DEPARTMENT of AGRICULTURE ★ SOIL CONSERVATION SERVICE**

Collaborating with

**CALIFORNIA DEPARTMENT of WATER RESOURCES**

and

**BRITISH COLUMBIA DEPARTMENT of  
LANDS, FORESTS and WATER RESOURCES**

AS OF  
**MAR. 1, 1971**

## TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will interact with a resultant average effect on runoff. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountain areas. A total of about ten samples are taken at each location. The average of these are reported as snow depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1900 snow courses in Western United States and in the Columbia Basin in British Columbia. Networks of automatic snow water equivalent and related data sensing devices, along with radio telemetry are expanding and will provide a continuous record of snow water and other parameters of key locations.

Detailed data on snow course and soil moisture measurements are presented in state and local reports. Other data on reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

## PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Conservation Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperation with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States and all state reports may be obtained from Soil Conservation Service, Western Regional Technical Service Center, Room 209, 701 N. W. Glisan, Portland, Oregon 97209.

Copies of state and local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	P. O. Box "F", Palmer, Alaska 99645
Arizona	6029 Federal Building, Phoenix, Arizona 85025
Colorado (N. Mex.)	12417 Federal Building, Denver, Colorado 80202
Idaho	Room 345, 304 N. 8th. St., Boise, Idaho 83702
Montana	P. O. Box 970, Bozeman, Montana 59715
Nevada	P. O. Box 4850, Reno Nevada 89505
Oregon	1218 S. W. Washington St., Portland, Oregon 97205
Utah	4012 Federal Bldg., 125 South State St., Salt Lake City, Utah 84111
Washington	360 U.S. Court House, Spokane, Washington 99201
Wyoming	P. O. Box 2440, Casper, Wyoming 82601

## PUBLISHED BY OTHER AGENCIES

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P. O. Box 388, Sacramento, California 95802 --- and for British Columbia by the Department of Lands, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia



# **WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES**

**Including Columbia River Drainage in Canada**

ISSUED

MARCH 1, 1971

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Weather Bureau, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Branch, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Alaska, Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Survey Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
KENNETH E. GRANT, ADMINISTRATOR







# WATER SUPPLY OUTLOOK

1971 SNOWMELT SEASON  
MARCH 1, 1971

PRESENT SNOWPACKS AND RESERVOIR STORAGE PROMISE GOOD TO EXCELLENT WATER SUPPLIES NEXT SUMMER FOR MOST WESTERN AREAS. ARIZONA AND NEW MEXICO WATER USERS WITHOUT ADEQUATE RESERVOIR SUPPLIES CAN EXPECT WATER SHORTAGES.

Mountain snowfall was generally below average during February in most western areas, decreasing the area of potentially damaging high water flows but increasing the probability of much below normal streamflow in Arizona and New Mexico.

Snowpacks which rank among the highest few years of record now lie on most watersheds of central and southwestern Montana, central and southern Idaho, central and northern Utah, western and southern Wyoming and extending into northern Colorado on the North Platte River.

Forecasts of streamflow in the above heavy snowpack areas generally range from about 140 to 200 percent of average.

In contrast to the above, snow cover is so light in Arizona that streamflow forecasts range from 13 percent on the Little Colorado River to 48 percent of average on the Verde River. Fortunately, however, reservoir storage will offset this poor condition in all major irrigated areas except on the San Carlos Project and along the upper Gila River. A water allotment of 28 percent average has been made on the San Carlos Project. Storage in San Carlos Reservoir is only 7 percent of average.

In New Mexico, forecasts range from 21 percent on the Mimbres, 54 percent on the Pecos, to near three-fourths normal on the Conejos, Chama and Rio Grande rivers. Storage in Elephant Butte Reservoir is near average.

The California Department of Water Resources reports that the third driest February in 10 years has materially diminished the State's water conditions from that reported one month ago. March 1 snow surveys indicated a water content in the pack of 110 percent of normal for this date. Present prospects are for near normal to normal water supplies being available to California water users this summer.

Although the snowpack is heavy on the major

water producing areas of the United States portion of the Columbia Basin, it falls off to about 5 to 15 percent above average on the Columbia and Kootenay rivers in British Columbia, as reported by the British Columbia Water Resources Service, Department of Lands, Forests and Water Resources. In western B.C. the snow cover increases to near 125 percent average on the Okanogan-Similkameen watersheds.

Lowest streamflow forecast in the Columbia Basin is for Oregon's Umatilla River at 88 percent. Most streams originating in the Cascade Mountains of Oregon, Washington and western B.C., as well as the Montana tributary streams, Idaho's Clearwater and Salmon rivers and Oregon's east central, high elevation streams, should all yield near 10 to 30 percent above average flows.

Other areas where streamflow is expected to range between about 10 to 30 percent above usual amounts includes streams in northern Montana originating along the Continental Divide north of Helena, Wyoming's Wind, Shoshone and Big Horn rivers, and Colorado's South Platte, Yampa and White rivers.

Streamflow prospects are less favorable in southern Colorado on the Arkansas, upper Rio Grande, San Juan and Gunnison rivers. Forecasts for these streams generally range between 75 to 90 percent of average.

With April-July inflow to Lake Powell on the Colorado River forecast at 110 percent average, prospects for water and power interests in the Lower Colorado Basin are good.

Major streams in Nevada are forecast to flow at very near average amounts (95 to 105 percent). This, combined with excellent reservoir storage, assure good to excellent water supplies.

With isolated exceptions, storage in principal irrigation reservoirs is average or well above in all states of the west.

## SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS

MARCH 1, 1971

MAJOR BASIN AND SUB - WATERSHED	WATER EQUIVALENT IN PERCENT OF:		MAJOR BASIN AND SUB - WATERSHED	WATER EQUIVALENT IN PERCENT OF:	
	LAST YEAR	AVERAGE		LAST YEAR	AVERAGE
MISSOURI BASIN			SNAKE BASIN		
Jefferson	156	138	Snake above Jackson, Wyo.	134	140
Madison	144	138	Snake above Hiese, Idaho	135	145
Gallatin	109	140	Snake abv.American Falls Res.	135	140
Missouri Main Stem	125	135	Henry's Fork	145	140
Yellowstone	125	146	Southern Idaho Tributaries	115	140
Shoshone	168	145	Big and Little Wood	165	148
Wind	193	158	Boise	125	145
North Platte	118	156	Owyhee	66	75
South Platte	84	122	Payette	115	145
ARKANSAS BASIN			Malheur	81	103
Arkansas	83	103	Weiser	110	140
Cucharas-Purgatoire	100	71	Burnt	84	113
RIO GRANDE BASIN			Powder	104	128
Rio Grande (Colo.)	133	81	Salmon	130	135
Rio Grande abv.Otowi Bridge	100	46	Grande Ronde	107	106
Pecos	300	19	Clearwater	125	110
COLORADO BASIN			LOWER COLUMBIA BASIN		
Green (Wyo.)	150	149	Yakima	103	126
Yampa - White	108	126	Umatilla	85	75
Duchesne	153	123	John Day	81	90
Price	125	120	Deschutes - Crooked	144	119
Upper Colorado	102	133	Hood	141	136
Gunnison	94	100	Willamette	197	134
San Juan	144	82	Lewis	209	154
Dolores	113	110	Cowlitz	117	147
Virgin	246	111	PACIFIC COASTAL BASIN		
Gila	56	23	Puget Sound	178	141
Salt	137	30	Olympic Peninsula	164	120
GREAT BASIN			Umpqua - Rogue	167	118
Bear	152	150	Klamath	149	97
Logan	144	147	Trinity	90	105
Ogden	149	148	CALIFORNIA		
Weber	129	126	CENTRAL VALLEY		
Provo - Utah Lake	132	117	Upper Sacramento	115	110
Jordan	106	116	Feather	135	135
Sevier	157	115	Yuba	160	120
Walker - Carson	99	95	American	135	120
Tahoe - Truckee	125	124	Mokelumne	150	120
Humboldt	90	91	Stanislaus	120	100
Lake Co. (Oregon)	113	95	Tuolumne	125	100
Harney Basin (Oregon)	80	93	Merced	150	105
UPPER COLUMBIA BASIN			San Joaquin	125	95
Columbia (Canada)	160	108	Kings	125	95
Kootenai	130	116	Kaweah	125	80
Clark Fork	140	122	Tule	135	80
Bitterroot	135	122	Kern	105	80
Flathead	125	120	<i>Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.</i>		
Spokane	125	110			
Okanogan	147	123	<i>Average is for 1953-67 period. California averages are for the period 1931-65. Based on Selected Snow Courses determined by Dis- tribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.</i>		
Methow	121	124			
Chelan	173	126			
Wenatchee	116	147			



## MISSOURI BASIN

Snowpack readings are record or near record high on southwestern Montana drainages of the upper Missouri River headwater area. It is also high (125 to 145 percent) on other Montana tributaries, including the Milk, Marias, Teton, Sun, Judith, Musselshell, Yellowstone and Little Big Horn rivers. Streamflow forecasts are for volumes to be near or above those of last year. Major streams in southwest and central Montana are forecast to be about 40 percent above average, while the Beaverhead River should produce near twice its normal flow. Streams originating along the Continental Divide north of Helena are forecast to yield between 10 and 20 percent above average flows.

To the south in Wyoming the snow cover continues high. With the exception of a small area south of Casper and on the Powder River-Crazy Woman drainages where snow is near average, the snowpack ranges from about 130 to 160 percent. Flow of Clark's Fork, the Shoshone and Wind-Big Horn rivers will be near 120 to 140 percent average. While reservoir storage on the Wind River is 77 percent normal, the deficit will be more than offset by the high flows so that normal or better storage should be available for carryover into next year.

On the North Platte drainage above Saratoga the snow is exceptionally heavy, with some courses holding the most snow in 35 years. The North Platte should yield near 160 percent of average volumes, while the Laramie River is forecast at 140 percent.

Although February snowfall was somewhat less than normal on the South Platte, the snowpack is still well above average. With tributary streams expected to yield 15 to 20 percent greater than usual flows and excellent carryover reservoir storage, water users should have an excellent year.

With the exception of the Wind River as noted above, reservoir storage is well above average throughout the Missouri Basin.

## ARKANSAS BASIN

Snow cover is average on the upper Arkansas River above Salida, Colorado, but it falls off rapidly on southern tributaries. While flow of the Arkansas is expected to be about 10 percent below average at Salida, water supplies should be generally adequate because reservoir storage is satisfactory. The Cucharas and Purgatoire rivers currently have streamflow prospects of 75 and 86 percent of average amounts, respectively.

In New Mexico there is very little snow on the Canadian River. Storage in Conchas

Reservoir is 94 percent of average. Wet spring weather would be helpful on this watershed.

## RIO GRANDE BASIN

The snowpack is below normal on all watersheds of the Rio Grande Basin. It is particularly low in New Mexico where measurements show that the snow is 19 percent of normal on the Pecos River, 46 percent on the Rio Grande, 47 percent on Red River and 72 percent on the Rio Chama. It is somewhat higher on the upper Rio Grande in Colorado with 81 percent.

Reflecting the low snow cover, streamflow forecasts are also well below normal. Flow of the Rio Grande near Del Norte, Colorado is expected to be about 20 percent below average. Inflow to the river system from the Conejos and Chama rivers should be near three-fourths of their usual contributions. Surface runoff water supplies are expected to be considerably less favorable on the Pecos, with runoff forecast to be only 54 percent average.

Carryover storage is within a few percent of being average in Elephant Butte Reservoir, but is less than normal on the Pecos River. Considerably more snow is needed on all watersheds of the Rio Grande Basin to assure good water supplies next summer.

## COLORADO BASIN

While the present snow cover in the upper Colorado River Basin is very favorable as a whole, it shows marked variability within the Basin. The heaviest snow cover is on tributaries to the Green River in Wyoming and averages near 150 percent of usual amounts. The snow decreases steadily to the south, with about 120 to 135 percent snowpacks lying on watersheds of the Yampa, White, Duchesne, Price and upper Colorado rivers. It decreases further across the Gunnison and Dolores rivers to about 82 percent on the San Juan River.

The generally favorable snowpack, combined with soil moisture conditions which are above average in most areas, provide a satisfactory to excellent water supply outlook for next summer. Prospective runoff continues lowest in the Four Corners area on watersheds of the San Juan, Dolores, Uncompahgre and Gunnison rivers. From 10 to 25 percent less than average streamflow is expected here.

The stream with the highest forecast is the Little Snake near Dixon, Wyoming (162 percent), followed closely by the New Fork near Boulder, Wyoming (159 percent) and inflow to Flaming Gorge Reservoir, Utah (157 percent).

# SELECTED STREAMFLOW FORECASTS

APRIL - SEPTEMBER as of MARCH 1, 1971

STREAM AND STATION	FORECASTS THIS YEAR		LAST YEAR'S FLOW IN (1,000 A.F.)
	FLOW IN (1,000 A.F.)	PERCENT OF AVERAGE	
UPPER MISSOURI			
Jefferson at Sappington, Montana	1,360	144	664
Madison near Grayling, Montana <u>1/</u>	557	130	
Gallatin near Gateway, Montana	645	140	
Smith River near Eden, Montana	270	151	
Sun at Gibson Dam, Montana <u>3/</u>	705	117	555
Belt near Monarch, Montana	160	147	646
Marias near Shelby, Montana <u>4/</u>	690	114	
Missouri near Lundusky, Montana <u>2/</u>	6,000	134	
S. F. Musselshell above Martinsdale, Montana	57	123	
Milk near Eastern Crossing, Montana (March-September)	320	114	2,172
Yellowstone at Yellowstone Lake Outlet, Wyo. (Apr.-Oct.)	1,100	132	
Yellowstone at Corwin Springs, Montana	2,450	130	
Clark Fork at Belfry, Montana	750	129	
Shoshone, Inflow to Buffalo Bill Res., Wyo.	1,000	123	
Wind at Dubois, Wyoming	130	130	
Wind at Riverton, Wyoming	910	140	
Bull Lake near Lenore, Wyoming	228	128	
Tensleep near Tensleep, Wyoming	77	104	
Medicine Lodge near Hyattville, Wyoming	240	121	
Shell Creek near Shell, Wyoming	80	122	2,105
Big Horn at St. Xavier	2,500	145	
Tongue near Dayton, Wyoming	128	124	
Yellowstone at Miles City, Montana <u>5/</u>	8,150	139	
Missouri near Williston, N. Dakota <u>6/</u>	15,100	137	
PLATTE			
North Platte at Saratoga, Wyoming	888	160	2,105
Encampment near Encampment	200	157	
Laramie near Jelm, Wyoming <u>7/</u>	148	142	
Big Thompson at Drake, Colorado	115	115	
Clear at Golden, Colorado	145	122	
St. Vrain at Lyons, Colorado	83	119	
Cache LaPoudre near Fort Collins, Colorado <u>8/</u>	250	116	
ARKANSAS			
Arkansas at Salida, Colorado <u>9/</u>	275	89	86
Cucharas near LaVeta, Colorado	9	75	
Purgatoire at Trinidad, Colorado	40	86	
RIO GRANDE			
Rio Grande near Del Norte, Colorado <u>10/</u>	350	80	54
Conejos near Mogote, Colorado <u>11/</u>	135	74	
El Vado Res., Inflow, New Mex. (March-July)	140	74	
Rio Grande at Otowi Bridge, New Mex. <u>12/</u> (March-July)	380	74	
Pecos at Pecos, New Mexico (March-July)	22	54	
UPPER COLORADO			
Granby Reservoir Inflow, Colorado <u>13/</u>	275	126	985
Colorado at Dotsero, Colorado <u>14/</u>	1,450	105	
Roaring Fork at Glenwood Springs, Colorado <u>15/</u>	700	101	
Colorado near Cameo, Colorado <u>16/</u>	2,360	106	
Uncomphagre at Colona, Colorado	115	89	
Gunnison near Grand Junction, Colorado <u>16/</u>	930	82	
Dolores at Dolores, Colorado	200	87	
Colorado near Cisco, Utah <u>16/</u> **	2,605	93	
Green at Warren Bridge, Wyoming	470	145	
New Fork near Boulder, Wyoming	345	159	
Flaming Gorge Res., Utah, Net Inflow <u>17/</u> **	1,660	157	
Yampa at Steamboat Springs, Colorado	350	135	
Yampa near Maybell, Colorado	1,100	129	
Little Snake near Dixon, Wyoming	420	162	
White near Meeker, Colorado	355	121	

Forecasts in California provided by Department of Water Resources.  
Average is for 1953-67 period except California. California is computed for 1916-65 period.  
Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season.

Explanatory Notes on Forecasts listed on Inside Back Cover.  
\* April - September Period \*\* April - July Period \*\*\* May - July Period.

# SELECTED STREAMFLOW FORECASTS

APRIL - SEPTEMBER as of MARCH 1, 1971

STREAM AND STATION	FORECASTS THIS YEAR		LAST YEAR'S FLOW IN (1,000 A.F.)
	FLOW IN (1,000 A.F.)	PERCENT OF AVERAGE	
UPPER COLORADO (continued)			
Duchesne near Tabiona, Utah 18/ **	108	115	
Whiterocks near Whiterocks, Utah **	60	118	55
Duchesne at Randlett, Utah **	354	135	
Scofield Reservoir, Utah, Net Inflow 19/ **	40	125	
Green at Green River, Utah 17/ **	3,635	141	2,970
Navajo Reservoir Inflow, New Mexico **	470	76	446
Animas at Durango, Colorado	400	98	
San Juan near Bluff, Utah 20/ **	727	81	698
Colorado, Inflow to Lake Powell, Arizona 21/ **	7,180	110	8,220
LOWER COLORADO			
Virgin near Virgin, Utah (April-June)	40	105	21
Little Colorado above Lyman, Arizona (March-June)	1	13	4.9
Gila near Solomon, Arizona (March-May)	18	25	38
Frisco at Clifton, Arizona (March-May)	9	23	20
Salt at Intake, Arizona (March-May)	55	27	136
Tonto above Roosevelt, Arizona (March-May)	4	18	10
Verde above Horseshoe Dam, Arizona (March-May)	51	48	81
GREAT BASIN			
Bear at Harer, Idaho	430	190	
Logan near Logan, Utah 22/ **	134	135	
Ogden, Inflow to Pine View Res., Utah 23/ (April-June)	145	161	
Weber near Oakley, Utah (April-June)	127	136	
Utah Lake, Utah, Net Inflow **	278	143	
Big Cottonwood near Salt Lake City, Utah **	38	112	38
Beaver near Beaver, Utah **	24	127	23
Sevier near Hatch, Utah **	34	103	22
Sevier near Gunnison, Utah **	54	174	68
Humboldt at Palisades, Nevada **	165	107	218
Truckee at Farad, California 26/ **	300	116	196
East Carson near Gardnerville, Nevada **	181	103	185
West Walker near Coleville, California **	143	96	133
Donner und Blitzen near Frenchglen, Oregon (March-July)	57	100	52
Silvies near Burns, Oregon (March-July)	128	127	
Chewaucan near Paisley, Oregon (March-July)	91	100	
Deep above Adel, Oregon (March-July)	74	104	
UPPER COLUMBIA			
Columbia at Revelstoke, British Columbia			
Kootenai at Libby, Montana	8,300	103	5,362
Kootenai at Leonia, Idaho	9,600	104	6,256
Blackfoot near Bonner, Montana	1,240	123	977
Flathead near Columbia Falls, Montana 27/	7,300	113	5,791
Flathead near Polson, Montana 27/	8,900	115	6,828
Clark Fork above Missoula, Montana	2,160	123	1,786
Bitterroot near Darby, Montana	660	118	629
Clark Fork at Plains, Montana 27/	14,700	118	11,901
Columbia at Birchbank, British Columbia 27/	49,500	107	34,443
Priest near Priest River, Idaho **	980	107	
Pend Oreille below Box Canyon, Washington	18,900	118	14,234
Kettle near Laurier, Washington	2,100	109	1,123
Spokane at Post Falls, Idaho 28/	3,300	105	2,839
Columbia at Grand Coulee, Washington 27/	77,500	112	54,604
Okanogan near Tonasket, Washington	2,030	117	917
Methow near Pateros, Washington	1,190	113	
Stehekin at Stehekin, Washington	1,090	121	
Chelan at Chelan, Washington 29/	1,520	120	907
Wenatchee at Peshastin, Washington	2,210	122	1,420



# SELECTED STREAMFLOW FORECASTS

APRIL - SEPTEMBER as of MARCH 1, 1971

STREAM AND STATION	FORECASTS THIS YEAR		LAST YEAR'S FLOW IN (1,000 A.F.)
	FLOW IN (1,000 A.F.)	PERCENT OF AVERAGE	
SNAKE			
Snake above Palisades Res., Wyoming <u>30/</u>	3,450	135	
Grey's above Palisade, Wyoming	570	157	
Salt above Palisade, Wyoming	490	153	
Snake near Heise, Idaho <u>30/</u>	4,800	128	4,050
Henry's Fork near Rexburg, Idaho <u>31/</u>	1,440	117	
Teton near St. Anthony, Idaho	450	114	
Big Lost near Mackay, Idaho <u>32/</u>	210	125	203
Blackfoot Reservoir Inflow, Idaho	135	132	
Portneuf at Topaz, Idaho (March-September)	110	140	
Salmon Falls Creek nr San Jacinto, Idaho (March-September)	105	151	
Big Wood, Inflow to Magic Res., Id. <u>33/</u> (April-September)	470	175	248
Bruneau near Hot Springs, Idaho (March-September)	280	148	
Owyhee Res., Net Inflow, Oregon (March-July)	369	100	353
Boise near Boise, Idaho <u>34/</u>	2,300	148	1,658
Malheur near Drewsey, Oregon (March-July)	120	129	
Payette near Horseshoe Bend, Idaho <u>35/</u>	2,650	144	2,066
Weiser abv Crane Creek, Idaho (March-September)	700	139	
Snake at Weiser, Idaho	8,500	135	7,172
Powder near Baker, Oregon **	66	110	
Imnaha at Imnaha, Idaho	343	105	295
Salmon at Whitebird, Idaho	8,800	128	7,378
Grande Ronde at LaGrande, Oregon (March-July)	197	95	180
Clearwater at Spalding, Idaho	10,500	122	7,982
LOWER COLUMBIA			
Yakima at Cle Elum, Washington <u>36/</u>	1,090	113	
Umatilla at Pendleton, Oregon (April-September)	138	88	155
John Day, Middle Fork at Bitter, Oregon (April-September)	140	121	
Crooked near Post, Oregon (April-September)	97	96	
Deschutes at Benham Falls, Oregon <u>37/</u> **	635	106	
Columbia at The Dalles, Oregon <u>27/</u>	123,000	117	87,067
Hood near Hood River, Oregon <u>37/</u> **	324	115	
Willamette at Salem, Oregon <u>37/</u> **	5,300	113	
Lewis at Ariel, Washington <u>38/</u>	1,550	114	869
Cowlitz at Castle Rock, Washington	3,210	114	2,079
NORTH PACIFIC COASTAL			
Dungeness near Sequim, Washington	171	99	
Umpqua, No., near Tokatee Falls, Oregon	186	106	
Rogue at Raygold, Oregon	818	105	672
Klamath Lake, Net Inflow, Oregon (April-September)	610	98	345
Trinity at Lewiston, California **	700	113	434
CALIFORNIA CENTRAL VALLEY <u>39/</u>			
Sacramento, Inflow to Shasta, California **	1,900	107	1,364
Feather near Oroville, California **	2,200	118	1,116
Yuba at Smartville, California **	1,240	115	611
American, Inflow to Folsom Res., Calif. **	1,480	113	816
Cosumnes at Michigan Bar, California **	160	110	67
Mokelumne, Inflow to Pardee Res., Calif. **	520	112	397
Stanislaus, Inflow to Melones Res., Calif. **	660	92	590
Tuolumne, Inflow to Don Pedro Res., Calif. **	1,070	90	1,045
Merced, Inflow to Excheque Res., Calif. **	490	81	465
San Joaquin, Inflow to Millerton Lake, Calif. **	1,020	85	907
Kings, Inflow to Pine Flat Res., California **	950	82	871
Kaweah, Inflow to Terminus Res., California **	220	81	204
Tule, Inflow to Success Res., California **	35	59	32
Kern, Inflow to Isabella Res., California **	260	62	317
ALASKA			
Chena at Fairbanks, Alaska (May-June)			
Salcha near Salchaket, Alaska (May-June)			

Forecasts in California provided by Department of Water Resources.  
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Explanatory Notes on Forecasts listed on Inside Back Cover.  
\* April - September Period \*\* April - July Period \*\*\* May - July Period.

Forecasts for the Yampa, White and Duchesne rivers range from about 120 to 135 percent. April-July inflow to Lake Powell is forecast at 7,180,000 acre-feet, or 110 percent average. Storage in irrigation reservoirs is well above average.

In the Lower Colorado Basin the Virgin River should yield a little better than average flows, while the Santa Clara will yield a little below average. In Arizona water supplies will be adequate in all major irrigated areas except on the San Carlos Project and along the upper Gila. An apportionment of  $\frac{1}{2}$  an acre-foot has been declared for the San Carlos Project. This is 28 percent of average and only  $\frac{1}{5}$  of that received last year. Carryover storage is near average or above in all major reservoirs except San Carlos. It contains only 7 percent of average.

Streamflow forecasts in Arizona range from 13 percent on the Little Colorado to 48 percent of average on the Verde River.

## GREAT BASIN

The exceptionally heavy, early season snow pack, which was reduced during January by warm temperatures and rain, continued to fall off percentagewise during February. While snow cover still remains near 115 to 150 percent of average on most Utah watersheds, it is more nearly average in Nevada. With the exception of the Tahoe-Truckee Basin where snow ranges from about 125 to 135 percent, and northeast Nevada (80 percent), all other major Nevada drainages have a 90 to 110 percent average snowpack.

The present snowpack, combined with excellent reservoir storage, assures good to excellent water supplies next summer for all major irrigated areas. Because of early removal of snow, some high elevation desert areas in Oregon and extreme northwest Nevada will dry up earlier than usual unless spring months are wet.

In Utah, streamflow forecasts for all areas are essentially average or higher, with most streams expected to yield from near 130 percent to about twice average amounts. The Bear River at Harer, Idaho is forecast at 190 percent. Most forecasts for streams in the Weber, Ogden, Provo and Utah Lake drainages range from near 135 to 175 percent.

Utah Lake is expected to reach Compromise Point by April 1 and will then rise above it as the main snowmelt runoff comes. Inflow for the April-July period is forecast at 278,000 acre-feet, or 143 percent of average.

Major streams in Nevada are forecast to flow at very near average amounts (95 to

105 percent). In Oregon, flow of streams in Lake and Harney counties will be near average, except on the Silvies River where the flow is anticipated to be 127 percent.

Reservoir storage in both Utah and Nevada is 143 percent of average.

## COLUMBIA BASIN

Excellent to average water supplies are expected for all sections of the Columbia Basin this year.

February snowfall was generally light in most of the Basin, principal exception being on the Columbia and Kootenai drainages in Canada where it was above normal.

The British Columbia Water Resources Service reports the March 1st snowpack to be about 5 to 15 percent above average on the Columbia and Kootenai drainages. It increases to near 20 to 25 percent above average on the Okanogan-Similkameen watersheds.

The only areas of significantly below normal snowpack in the Basin are on the Umatilla and Owyhee rivers, where the pack is 75 percent. It is 90 percent average on the upper John Day River.

The largest area where snow cover is much above normal is on the Snake River in southern Idaho and in Wyoming. On these watersheds the snow ranges between about 140 to 180 percent average. Snow on the Wenatchee, Lewis and Cowlitz rivers in Washington is also heavy - about 145 to 155 percent. Watersheds in the United States where the snow ranges between 120 and 140 percent average include all remaining watersheds draining from the Cascades in Washington and Oregon, all Montana tributaries, Idaho's Salmon River and Oregon's Powder River. Snow on other watersheds ranges from average to 120 percent.

The warm, dry weather actually decreased the snowpack on many middle and lower elevation snow courses in Oregon and Washington. Low elevation snow courses in eastern Oregon were nearly bare of snow. In Idaho, however, the lower elevation snowpack, which usually begins to lose water during late February, continued to increase in water content. This fact continues a serious flood potential on low elevation watersheds in southern and southeastern Idaho, depending on how future weather conditions remove the snow.

Streamflow forecast follows the snow pattern. As examples, inflow to Magic Reservoir on Idaho's Big Wood River is forecast at 175 percent, Salmon Fall's Creek at 151 percent and Wyoming's Greys River at 157 percent. Lowest forecast is for Oregon's Umatilla

## STORAGE IN LARGE RESERVOIRS

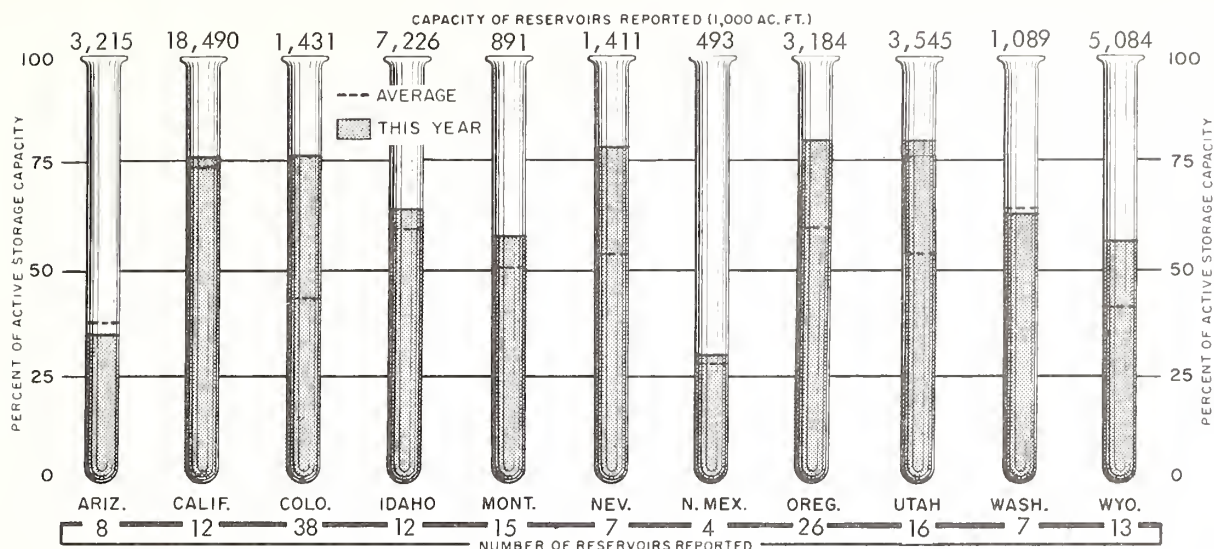
MARCH 1, 1971

BASIN AND NAME OF RESERVOIR	CAPACITY (1,000 A.F.)	STORAGE (1,000 A.F.)	STORAGE PERCENT AVERAGE	BASIN AND NAME OF RESERVOIR	CAPACITY (1,000 A.F.)	STORAGE (1,000 A.F.)	STORAGE PERCENT AVERAGE
UPPER MISSOURI				UPPER COLUMBIA			
Belle Fourche	185	126	154	Chelan	676	257	105
Boysen	550	259	67	Coeur d'Alene	225	154	113
Buffalo Bill	373	151	108	Duncan	1,347	71	---
Canyon Ferry	2,043	1,577	101	Flathead	1,791	927	96
Fort Peck	19,140	16,330	150	Hungry Horse	3,428	2,111	93
Garrison	24,500	19,513	184	Kootenay	673	422	98
Hebgen	377	266	156	Lower Arrow	3,083	323	82
Keyhole	192	113	324	Noxon Rapids	335	331	113
Lake Francis Case	5,816	3,495	104	Pend Oreille	1,155	364	72
Lake Sharp	1,900	1,750	106	Roosevelt	5,232	4,666	156
Oahe	23,630	19,646	170	Upper Arrow	4,061	218	25
Tiber	1,347	483	77	LOWER COLUMBIA			
Big Horn	1,356	696	119	Cougar	155	86	---
PLATTE				Detroit	300	156	164
City of Denver (5)	507	467	165	Hills Creek	200	119	189
Colo-Big Thompson (3)	718	573	144	Lookout Point	337	194	166
Glendo	784	404	129	Yakima Res. (5)	1,066	684	101
Pathfinder	1,016	842	221	SNAKE			
Seminole	1,010	417	131	American Falls	1,700	1,339	94
ARKANSAS				Anderson Ranch	423	266	124
Conchas	273	154	94	Arrowrock	287	278	110
John Martin	354	27	31	Brownlee	980	508	---
RIO GRANDE				Cascade	653	373	136
Elephant Butte	2,195	362	98	Jackson	847	602	137
El Vado	195	1	110	Lucky Peak	278	69	64
UPPER COLORADO				Owyhee	715	674	164
Blue Mesa	830	421	---	Palisades	1,200	890	125
Flaming Gorge	3,749	1,807	---	PACIFIC COASTAL			
Navajo	1,696	852	---	Clair Engle	2,448	2,215	111
Powell	25,002	12,414	---	Clear Lake	440	341	150
LOWER COLORADO				Nacimiento	350	168	89
Havasu	619	547	102	Ross	1,203	913	107
Mead	26,159	16,523	100	Upper Klamath	584	446	106
Mohave	1,810	1,700	100	CALIFORNIA CENTRAL VALLEY			
Salt River Res. (4)	1,755	928	97	Almanor	1,036	727	107
San Carlos	985	8	7	Berryessa	1,602	1,608	107
Verde River Res. (2)	318	158	134	Folsom	1,010	568	97
GREAT BASIN				Isabella	570	174	104
Bear	1,421	1,095	126	McClure	1,026	590	110
Lahontan	286	231	121	Millerton	521	376	108
Rye Patch	179	185	250	New Bullards Bar	930	442	50
Sevier Bridge	236	218	270	Oroville	3,484	3,091	111
Strawberry	274	191	159	Pine Flat	1,013	701	132
Tahoe	732	530	129	Shasta	4,500	3,440	101
Utah	884	860	154				
Willard Bay	193	185	---				

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.



# RESERVOIR STORAGE as of MARCH 1, 1971



River at Pendleton, at 88 percent.

Reservoir storage is average or better in all states. It is particularly high in Oregon where supplies are 132 percent of average. In Idaho, desert reservoirs such as those in the vicinity of Mountain Home and in Owyhee County are already filled to capacity for the first time in many years.

## ALASKA

Snow cover on the watersheds of the Chena, Salcha, and lower Tanana rivers is extremely heavy. Portions of the Koyukuk and Middle Yukon drainage areas in interior Alaska also have a greater than average snowpack for March 1. High runoff rates are expected from these regions during the snowmelt season.

February storms added significantly to the snowpack in the Talkeetna mountains north of Anchorage, and the mountains of southeastern Alaska near Juneau. Snow cover in these mountains is now also above average. The remainder of the state has light to normal snow cover.

The very low temperatures of early winter moderated somewhat during February and added snowfall accompanied the warmer weather.

Soils in interior Alaska were drier than normal at the beginning of winter.

## CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys

and water supply forecasting in California, reports that a four-week period of negatory rainfall and above normal temperatures has resulted in the spring runoff forecasts for the State's snowmelt streams being revised downward from 10 to 25 percent from that reported one month ago. Overall, the dry period has brought about a general normalizing in California's water conditions from the favorable prospects reported one month ago. The snowpack in the upper Sierra and Cascade watersheds generally retained the water content accumulated through December and January, and is now normal or above for this date, except in the San Joaquin Valley which was 95 percent. With all factors considered and assuming normal precipitation during the remainder of the season, the outlook is for near normal to normal water supplies in most areas of California during the coming spring and summer months.

Precipitation during February was limited to two fast-moving storms which did end the regime of above normal temperatures prominent throughout the State. Total rainfall during the month was 20 percent of the 40-year average, with only the extreme northernmost part of the State and the San Diego River Basin materially exceeding the State's average. Thus, February 1971 assumes the dubious distinction of being the third driest February in the past 10 years. The State normally receives 15 to 20 percent of its total seasonal rainfall and approximately 25 percent of its annual snow accumulation during February. As a result of the dry February, the seasonal precipitation for the period October through February was reduced to normal. The general distribution was normal and above north of Merced, ranging between 80 to 90 percent of normal south of Merced to the Tehachapi Mountains. South of the Tehachapi Mountains,

the South Coastal areas was 90 percent of normal while the Colorado Desert area was 20 percent of normal.

March 1 measurements from some 180 snow courses, 112 aerial snow depth markers, and 23 reporting snow sensors place the State's snowpack at 110 percent of normal for this date and 95 percent of the April 1 average. With the combination of meager precipitation during February and the above normal temperature regime, only about a third of the snow courses measured indicated any increase in water content from that measured February 1 with most increases an inch or less. In general, the lower elevation snow courses showed a greater percent of their April 1 average water content than those at the higher elevations. As expected, there was little change in the distribution of the snowpack. The Central Sierra is still the highest with the Feather River Basin showing 135 percent of average for this date. Dropping off to the north and south, the Pit and Kern River Basins were 106 and 79 percent of their normal for March 1, respectively.

Streamflow forecasts for the April-July period, which assumes that normal precipitation will occur for the remainder of the season, call for Central Valley tributaries to average 100 percent of normal. The Sacramento and San Joaquin Valleys will average 115 and 85 percent of normal, respectively. April-July runoff forecasts are above

normal for all major tributaries to the Sacramento Valley, varying from 118 to 107 percent of normal for the Feather River Basin and Upper Sacramento River Basin, respectively. In the San Joaquin Valley, April-July forecasts are all below normal and varied from 92 percent of normal for the Stanislaus River Basin to 64 percent of normal for the Kern River Basin.

Unimpaired runoff of California's major streams during February was 60 percent of the 50-year average for the month. Only a few streams in the North Coastal and Central Lahontan area were reported with flows of normal and above, while some coastal area streamflows were below 10 percent of their average for the month. February flows in the Sacramento and San Joaquin Valleys were 65 and 70 percent of average, respectively. Runoff for the period October through February, on a statewide basis, was 145 percent of normal while Central Valley tributaries' unimpaired runoff was 120 percent of normal for the period.

Based on March 1 storage, values from 121 major reservoirs which have a capacity of 28,084,000 acre-feet, the aggregate storage in California's reservoirs was 19,406,000 acre-feet or 105 percent of the 10-year average. This represents a net decrease of about 1,855,000 acre-feet of water stored from that reported one year ago.



# EXPLANATION of STREAMFLOW FORECASTS

All flows are observed flows except as adjusted for: 1/ Change in storage in Hebgen Lake. 2/ Change in storage in Canyon Ferry and Tiber reservoirs. 3/ Change in storage in Gibson Reservoir and measured diversions. 4/ Change in storage in Two Medicine, Four Horns and Lake Francis reservoirs. 5/ Change in storage in Boysen and Buffalo Bill reservoirs.

6/ Change in storage in Boysen, Buffalo Bill, Canyon Ferry, Tiber, and Fort Peck reservoirs. 7/ Plus diversions to Cache la Poudre. 8/ Minus diversions from North Platte, Laramie, and Colorado rivers plus measured diversions above station. 9/ Change in storage in Twin Lakes and Sugar Loaf reservoirs minus diversions from Colorado River. 10/ Change in storage in Rio Grande, Santa Maria, and Continental reservoirs.

11/ Change in storage in Platoro Reservoir. 12/ Change in storage in El Vado Reservoir. 13/ Change in storage in Granby Reservoir plus diversions to Cache la Poudre and through Adams Tunnel. 14/ Changes as indicated in (13) plus Moffat Tunnel diversion. 15/ Plus diversions to Arkansas River.

16/ Change in storage in Blue Mesa reservoir. 17/ Change in storage in Flaming Gorge, Fontenelle and Big Sandy reservoirs. 18/ Plus diversion through Duchesne Tunnel. 19/ Change in storage in Scofield Reservoir. 20/ Change in storage in Navaho Reservoir.

2 21/ (Lee's Ferry) Change in storage in Flaming Gorge, Navajo, Lake Powell and Big Sandy reservoirs. 22/ Plus Utah Power and Light Company tailrace and Logan, Hyde Park, and Smithfield canals. 23/ (Inflow record computed by U. S. Bureau of Reclamation.) 24/ Plus diversion by Weber-Provo Canal and change in storage in Wanship Reservoir. 25/ Change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake City Aqueduct.

26/ Change of storage in Lake Tahoe and Boca Reservoir. (Forecast by Truckee Basin Committee) 27/ Change in storage in any of these reservoirs above the station: Kootenai Lake, Hungry Horse, Flathead Lake, Pend Oreille Lake, F. D. Roosevelt Lake, Lake Chelan, Coeur d'Alene Lake, Brownlee and Noxon; and pumpage at Roosevelt Lake. 28/ Changes in storage in Coeur d'Alene Lake and diversions by Spokane Valley Farms Company and Rathdrum Prairie canals. 29/ Change in storage in Lake Chelan. 30/ Changes in storage for Jackson Lake and Palisades Reservoir above stations. 30/

31/ Change in storage in Henry's Lake, Island Park and Grassy Lake reservoirs and diversions between Ashton and Rexburg. 32/ Change in storage in Mackay Reservoir, and diversion in Sharp Ditch. 33/ (Combined flow Big Wood River nr. Bellevue and Camas Creek nr. Blaine.) 34/ Change in storage in Arrowrock, Anderson Ranch, and Lucky Peak. 35/ Change in storage in Cascade and Deadwood reservoirs. 36/ Change in storage in Keechelus, Kachess, and Cle Elum reservoirs plus diversion by Kittitas Canal. 37/ (Corrected to natural flow). 38/ Change in storage in Merwin, Yale, and Swift reservoirs. 39/ (Corrected for upstream impairments).



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